

REMARKS/ARGUMENTS

This is a Response to the Office Action mailed November 30, 2004, in which a three (3) month Shortened Statutory Period for Response has been set, due to expire February 28, 2005. Enclosed is our check to cover the fee for a one-month extension of time, to March 30, 2005. Fifty-one (51) claims, including ten (10) independent claims, were paid for in the application. Claims 1-15 and 35-51 have been withdrawn from consideration. Claim 16 is currently amended. No new matter has been added to the application. No fee for additional claims is due by way of this Amendment. The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090. Claims 16-34 are pending.

Information Disclosure Statement

Applicant notes that references cited in the Second Supplemental Information Disclosure Statement dated November 8, 2002, have not been acknowledged by the Examiner. Applicant respectfully requests that the Examiner provide acknowledgement of said references.

Election/Restriction

The Examiner has made the restriction requirement final. In doing so, the Examiner has not specifically addressed the various points raised in Applicant's previous traverse, but rather has characterized Applicant's traverse as only being on the ground that "the claims are so related as to present no serious burden to the Examiner." The Examiner summarily dismisses such by relying on the purported separate classification of the subject matter of the groups to demonstrate that searching all of the claims would present a substantial burden. Applicant respectfully traverses, and requests reconsideration of the restriction requirement.

As Applicant's previous response makes clear, the question of whether searching all of the claims would present a serious burden is only one of the issues presented by the restriction requirement, the other principal issue being the generic nature of the claims.

With respect to the seriousness of the burden, Applicant again notes that while the claims of Group II (claims 16-34) are directed to a control circuit, the control circuit is for a fuel

cell system. For example, claim 16 is directed to a control circuit, and such a control circuit is “for a fuel cell system having a fuel cell stack and a battery.” Claims 20, 25, 30 and 32 are all directed to a control circuit “for a fuel cell system.”

It appears necessary that to adequately search the claims directed to a control circuit for a fuel cell system, one would have to search class/subclass 429/21 (*i.e.*, CHEMISTRY: ELECTRICAL CURRENT PRODUCING APPARATUS, PRODUCT, AND PROCESS, FUEL CELL, SUBCOMBINATION THEREOF OR METHODS OF OPERATING, BY ELECTRICAL CURRENT), in addition to searching class/subclass 320/101 (*i.e.*, ELECTRICITY: BATTERY OR CAPACITOR CHARGING OR DISCHARGING, WIND, SOLAR, THERMAL, OR FUEL-CELL SOURCE). Likewise, it appears necessary that to adequately search the claims directed to a control circuit for a fuel cell system, one would also have to search class/subclass 307/66 (*i.e.*, ELECTRICAL TRANSMISSION OR INTERCONNECTION SYSTEMS, PLURAL SUPPLY CIRCUITS OR SOURCES, STORAGE BATTERY OR ACCUMULATOR).

The claims of Group I (claims 1-15, 46-51) are directed to a fuel cell system each of which includes a control circuit, which the Examiner indicated as being classified in class/subclass 429/21. It appears that to adequately search the claims directed to the fuel cell system that includes a control circuit, one would also have to search class/subclass 320/101. It also appears that to adequately search the claims directed to a fuel cell system that includes a control circuit, one would also have to search class/subclass 307/66.

The claims of Group III (claims 35-45) are directed to a method of operating a fuel cell system, which the Examiner indicated as being classified in class/subclass 307/66. The method is executable by a control circuit. It appears that to adequately search the claims directed to the method of operating a fuel cell system, one would necessarily have to search class/subclass 320/101. It also appears that to adequately search the claims directed to a method of operating a fuel cell system, one would have to search class/subclass 429/21.

With respect to the generic nature of the claims, Applicant specifically notes that claim 16 recites: “a series pass element and a regulating circuit for regulating current through the series pass element in response to a greater of a battery charging current error, a battery voltage

error and a stack current error.” Claim 1 (Group I) recites the same elements, in addition to a fuel cell stack and a battery. Claim 16 does not have any limitations that are not in claim 1, thus claim 16 is generic to claim 1. Similarly, claim 35 (Group III) recites “regulating current through a series pass element in response to a greater of the battery charging current error, the battery voltage error and the stack current error.” Thus, claim 16 is generic with respect to claim 35.

Objections

Claims 17-19 were objected to as being dependent on a rejected base claim. Applicant respectfully traverses the rejection of the base claim below.

Rejections Under 35 U.S.C. § 102(b)

Claim 16 was rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,823,358 (Rey).

Rey is directed to a battery peaking unit for fuel cell power plants. In general, Rey teaches an auxiliary power source such as a DC battery that can be electrically coupled in parallel with a fuel cell to supply additional current to a load when an overload condition causes the voltage across the fuel cell to drop below a threshold voltage. Rey, Abstract.

In particular, Rey is directed to a system where control of the transistor is solely reliant on the deviation between a measured voltage across the fuel cell and a threshold fuel cell voltage. This point is reiterated many times by Rey. For example, Rey teaches that a “transistor switch connected in series with the peaking battery” can be used to connect the battery to the inverter *when the fuel cell has insufficient voltage* to support the load by itself. Rey, col. 1, line 63-col. 2, line 5 (emphasis added). Also for example, Rey states “A voltage comparator 32 is connected to sense the fuel cell output voltage via lines 28 and 30. The fuel cell voltage is compared with a reference voltage shown as $-V$.” Rey, col. 3, lines 21-24. As a further example Rey goes on to state “Consequently, the batteries 20 will provide current through the inverter 16 to the load only when the output voltage from the fuel cell drops below a value determined by the reference voltage $-V$ and current will be provided only for a time determined by the timing pulse produced from multivibrator 38.” Rey, col. 4, lines 31-35.

Rey does not teach or suggest that deviations of measured battery voltage or current from desired battery voltage or currents be taken into account in regulating the current passed by the transistor. Rey's only teaching with respect to battery voltage is to control operation of the silicon controller rectifier to selectively provide power to the battery from an AC source when the battery voltage is low. Rey, col. 4, line 66-col. 5, line 14.

Additionally, the switching mechanism taught by Rey is a simple ON/OFF switching mechanism, and does not teach or suggest a regulating circuit for linearly regulating the magnitude of current passed via a series pass element. For example, Rey teaches that the use of a solid state switch such as a transistor "permits the battery to be *rapidly switched in* to provide additional current when required, but which during normal operation disconnects the battery from the circuit." Rey, col. 2, lines 51-56 (emphasis added). Also for example, Rey states that "The output of the multivibrator 38 is the logic control signal which ultimately causes the activation of the transistor switch 24." Rey, col. 3, lines 59-61. Rey goes on to state that "The output of the optically coupled transistor isolator 48 is fed through amplifier 50 to cause transistor 24 to turn on. When transistor 24 conducts, the impedance of transistor 24 becomes essentially zero and a closed path is provided for current from the batteries." Rey, col. 4, lines 3-7. Thus, it is clear that Rey is *not* concerned with linearly regulating current through the transistor, but employs the transistor as a simple ON/OFF switch.

Even the battery charging function of the circuit proposed by Rey is performed without a linear regulating circuit between the fuel cell and the battery. In this respect, Rey teaches rectifying AC current from the output of the inverter to make a pulsating DC current. The pulsating DC current is fed to the battery through a silicon controlled rectifier (SCR) 56. The DC current *must* be pulsating or the SCR would never turn OFF, since the SCR relies on having current drop to near zero in order to turn OFF after a pulse from the oscillator 60 turns ON the SCR. The separation of the battery charging circuit from the main power flow from the fuel cell to the load is fundamental to the operation of the circuit taught by Rey.

Additionally the pulsing ON and OFF control action of the AC fed battery charger (not a DC fed series pass linear regulator) is controlled by line 58 and line 62 in response to a fuel cell error (Rey, col. 3, lines 20-33) as well as when battery voltage drops below a preset

value (Rey, col. 6, lines 40-41). Further, the system proposed by Rey employs "taper charging" to charge the battery. Rey, col. 2, lines 11-19. Pulsating taper charging might be suitable for some lead acid wet cells, but it substantially reduces the life span of VRLA batteries, while smooth DC float charging does not.

Consequently, Rey does not teach or suggest a regulating circuit for linearly regulating current through a series pass element.

Turning to the claims, as originally filed, claim 16 recited, *inter alia*, "a regulating circuit for regulating current through the series pass element in response to a greater of a battery charging current error, a battery voltage error and a stack current error." The limitation is phrased in the conjunctive (*i.e.*, in response to *a greater of* a battery charging current error, a battery voltage error and a stack current error), not the disjunctive (*e.g.*, in response to *at least one of* a battery charging current error, a battery voltage error or a stack current error). As discussed above, Rey teaches turning a transistor ON and OFF based on a comparison between a measured voltage across a fuel cell and a threshold voltage. Also as discussed above, even if the voltage across the fuel cell stack served as an analogue for current from the fuel cell, Rey does not teach or suggest a regulating circuit for regulating current through the series pass element in response to a battery charging current error or a battery voltage error. Consequently, Rey does not teach or suggest a regulating circuit for regulating current through the series pass element in response to *a greater of a battery charging current error, a battery voltage error and a stack current error*.

As amended, claim 16 recites "a regulating circuit for linearly regulating current through the series pass element in response to a greater of a battery charging current error, a battery voltage error and a stack current error." As discussed above, Rey teaches a simple ON/OFF switching operation and does not teach or suggest a circuit for linearly regulating current through a series pass element.

Conclusion


Applicant thanks the Examiner for allowing claims 20-34, and for indicating the allowable subject matter of claims 17-19. Overall, the cited references do not singly, or in any

motivated combination, teach or suggest the claimed features of the embodiments recited in independent claim 16, and thus such claim is allowable. Because claims 17-19 depend from allowable independent claim 16, and also because they include additional limitations, such claims are likewise allowable. If the undersigned attorney has overlooked a relevant teaching in any of the references, the Examiner is requested to point out specifically where such teaching may be found.

In light of the above amendments and remarks, Applicant respectfully submits that all pending claims are allowable. Applicant, therefore, respectfully requests that the Examiner reconsider this application and timely allow all pending claims. Examiner Martin is encouraged to contact Mr. Abramonte by telephone to discuss the above and any other distinctions between the claims and the applied references, if desired. If the Examiner notes any informalities in the claims, she is encouraged to contact Mr. Abramonte by telephone to expediently correct such informalities.

Respectfully submitted,

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